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3. It has been existent in Porto Rico for many years and was probably introduced through various channels at different times.

4. It has spread more rapidly of late years, and the rate of spread will become still more rapid as time goes on unless measures are taken to control it.

5. On account of the serious effects of the disease, it becomes a public-health problem of great gravity and difficulty, demanding urgent measures for control and prevention.

6. This condition of affairs will not improve if let alone, but will steadily become worse unless efficient work is done against it. In the light of our present knowledge of trachoma, there is no quick and easy method of fighting it. A campaign against it may be compared to that against tuberculosis and means organized effort, trained workers, and the expenditure of energy and money for many years.

7. Suspicious cases deserve equal consideration with positive ones because a certain number of them are undoubtedly trachoma and may be sources of infection. Also, because trachoma is more amenable to treatment in the earlier stages.

8. The topographical features of the country have apparently had no influence upon the disease in Porto Rico.

9. Trachoma seems more prevalent in rural districts than in town, but this observation needs confirmation by more extended investigation.

10. Age within school limits has no influence.

11. Males are more frequently affected than females.

12. Negroes apparently enjoy a partial racial immunity, although the percentage of occurrence among them is remarkably higher in Porto Rico than is reported in the United States.

13. This immunity is apparently lost by mixture with white or Indian blood.

14. Trachoma is not limited to the poorer classes of society in Porto Rico, but affects those of higher social grade to a surprising degree.

A NEW BACTERIAL DISEASE OF RODENTS

TRANSMISSIBLE TO MAN.[1]

By William B. Wherry, M. D., Professor of Bacteriology, University of Cincinnati.

Three years ago, while working in the Federal Laboratory at San Francisco on the distribution and epidemiology of plague among the California ground squirrels, McCoy (McCoy, Geo. W.—Public Health Bulletin No. 43, April, 1911) encountered a disease of these rodents which was of particular interest in that the lesions in ground squirrels, guinea pigs, white rats, and gray mice rather closely simulated those due to plague. Infected squirrels were obtained from widely distributed points between Los Angeles and Sacramento. Later, McCoy and Chapin (McCoy, Geo. W. and Chapin, Chas. W.—Jour. Infectious Diseases 1912, Vol. 10, p. 61, and Public Health Bulletin No. 53, January, 1912) published further observations and described the *Bacterium tularense* which they isolated and proved to be the cause of this disease. The extensive experiments of these workers will not be reviewed in detail, as the publications cited can be easily obtained. However, as the virus was extremely pathogenic for certain rodents, they were naturally anxious to determine its virulence for various animals and carried out extensive inoculations. They found guinea pigs, rabbits, white rats, gray mice, ground squirrels (*C. beecheyi*), the gopher (*T. bottae*), the Java and Rhesus monkeys quite susceptible; while the adult Norway rat (*M. norvegicus*) was usually immune, the young were only partly resistant; sheep were only slightly susceptible (one out of five). The following animals they found immune: Calf, pig, goat, cat, dog, pigeon.

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[1] Submitted for publication Dec. 8, 1914.

In a private communication to the writer, McCoy says that owing to the marked virulence of the virus for monkeys they fully expected a human case to turn up sooner or later. Working with Mr. B. H. Lamb, the writer has discovered two cases of human infection with *B. tularense* in Cincinnati. The first case has been reported in detail. (Wherry and Lamb—Jour. Infectious Diseases 1914, vol. 15, p. 331.) This case was in a meat cutter in a cheap restaurant who came under the care of Dr. Derrick T. Vail. He was suffering from an acute ulcerative conjunctivitis, with involvement of the preauricular and cervical glands on the corresponding side, fever, and marked prostration. The details of the clinical history of this case were published by Dr. Vail (D. T. Vail, The Ophthalmic Record, Oct. 1914). The second case was a farmer's wife who came under the care of Dr. Robert Sattler, who will report on it later. She also had an ulcerative conjunctivitis of the left eye, with marked edema, involvement of the preauricular and cervical glands, and marked prostration. The temperature in this case once went to 104° F. Her illness lasted over two months.

We were anxious to find the source of infection in this locality and naturally suspected wild rabbits, as these represent the chief variety of wild game sold in the markets. Our attention was further directed to rabbits through the reports of hunters that wild rabbits in Indiana and Kentucky were dying in large numbers. Through the cooperation of Dr. J. H. Landis, health officer of Cincinnati, we were able to examine two rabbits found dead on the M. farm about 6 miles from Vevay, Ind. (Switzerland County). Both of these rabbits showed the gross lesions of the disease and were proven by guinea pig inoculations and bacteriologic examinations to be infected with *B. tular-*

ense.[1] It is interesting to note here that Dr. Sattler's case came from a farm in Indiana about 4 miles distant from the M. farm. Through the further interest of Dr. Landis we are now engaged in testing out some rabbits from Kentucky and Ohio, which are in all probability also affected with the same disease. Hence we are inclined to conclude that this rodent disease is widely distributed and that extensive epizootics among wild rabbits occur frequently.

Further investigation will show whether the disease is transmitted to man frequently or not. While the human cases on record were both individuals who had handled and dissected wild rabbits and were both cases of conjunctivitis, it seems possible that infection may occur through less direct channels and that other types of infection in man may occur. On the basis of animal experiments it seems possible that ulcerative rhinitis, ulcerative or membranous sore throat, gastro-intestinal infection, or lymphadenitis secondary to cutaneous infection may occur. Susceptible rodents may be infected by feeding and by the introduction of infectious material into the eye or nose or upon an abrasion of the skin. Experiments on transmission by contact or association have failed in the case of guinea pigs and ground squirrels, but a recent experiment by Mr. Lamb was successful in the case of rabbits. In this experiment a rabbit, inoculated by placing infectious material in its eye, was kept in a runway with about 15 healthy rabbits which had been under observation for several weeks. In the course of about two weeks five of the rabbits associated with the sick one died of the disease. We believe this is due to gastro-intestinal infection, as rabbits kept together are very affectionate and will lick any sore place upon their companions. However, it should be borne in mind that rodent fleas may possibly transmit the disease to man, for McCoy and Chapin, in searching for a natural mode of transmission among ground squirrels, twice successfully transmitted the disease by means of 100 and 500 squirrel fleas, respectively.

Bacteriologic diagnosis.—We have not been able to find *B. tularense* in smears from the human cases. This is apparently due to the fact that here the organism occurs in the coccoid form and is not easily distinguished from the granular, colloidal débris present. In tissue smears from rabbits or guinea pigs recently dead of the disease the organism can be readily found in very large numbers. It never takes up dyes intensely and is demonstrated most clearly by aniline-water, Hoffman's Violet or Gentian Violet. When so stained it appears as rods varying from 0.5 to 1.0 micron in length and less than 0.5 micron in diameter, surrounded by a distinct capsular halo. A few hours after the death of an animal the organisms in the tissues round up into the coccoid form.

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[1] We have reported these findings in the Jour. Amer. Med. Assoc., 1914, vol. 63, p. 2041.

It can not be cultivated upon any of the ordinary laboratory media, even if this contains the blood of susceptible animals. But it can be isolated on the coagulated egg-yolk recommended by McCoy and Chapin. It is more convenient to resort to animal inoculation for a diagnosis than to attempt to grow the organism in cultures, as this sometimes fails even when the conditions for growth seem favorable. Guinea pigs usually die of the disease in about three days and rabbits in from three to six days.

The lesions found postmortem in guinea pigs, rabbits, and ground squirrels are very much alike and are characteristic. At the point of inoculation, e. g. in the subcutis, one finds a dry, yellowish exudate. The congested vessels radiate from this area to the regional glands, which are enlarged, firm, and white on section, and lie buried in the very much congested periglandular tissues. The spleen and liver are congested and hypertrophied and appear speckled with numerous yellowish-white foci of necrosis. The vessels of the heart and thorax are deeply injected. The lungs sometimes show a few small tubercle-like foci of necrosis or more commonly patchy red areas of consolidation.

Prophylaxis.—In the present state of our knowledge concerning the infection of man with this virus it would seem advisable to at least warn those who dissect rabbits of the danger of infection, and to urge an unusually thorough scrubbing of the hands and of any other objects which may have come in contact with possibly infectious material.

PLAGUE AND PLAGUE-LIKE DISEASE.

A REPORT ON THEIR TRANSMISSION BY STOMOXYS CALCITRANS AND MUSCA DOMESTICA.[1]

By N. E. WAYSON, Assistant Surgeon, United States Public Health Service.

The possible rôle of the stable and the house fly in the transmission of a plague-like disease affecting rodents (A Plague-like Disease of Rodents, Public Health Bulletin No. 43, April, 1911, by G. W. McCoy) to human beings was suggested by the occurrence of a human case of conjunctivitis with cervical adenitis and considerable systemic disturbance in a meat cutter who worked in a restaurant, the location of which was not far removed from an epizootic among rabbits. The case was caused by an organism simulating, or identical with, that which causes the plague-like disease among the rodents of California, especially the ground squirrels. (*Bacterium tularense*, the Cause of a Plague-like Disease of Rodents, Public Health Bulletin No. 53, G. W. McCoy and Charles W. Chapin; Infection of man

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[1] Submitted for publication Nov. 11, 1914.